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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/926,489	12/14/2001	Binh Vu Thien	01196	6690
23338	7590	09/07/2005	EXAMINER	
DENNISON, SCHULTZ, DOUGHERTY & MACDONALD 1727 KING STREET SUITE 105 ALEXANDRIA, VA 22314			ROY, SIKHA	
			ART UNIT	PAPER NUMBER
			2879	

DATE MAILED: 09/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/926,489

Applicant(s)

THIEN ET AL.

Examiner

Sikha Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16, 19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16, 19, 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 May 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date. _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The Amendment, filed on June 17, 2005 has been entered and is acknowledged by the Examiner.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the 'semiconductor substrate having active components therein for locally controlling electron emission' as claimed in claim 15 must be shown or the feature(s) canceled from the claim. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

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the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-6,8-14 and 19, 20 are rejected under 35 U.S.C. 102(a) as being anticipated by 'Serial Process for Electron Emission from Solid-state Field Controlled Emitters' by Binh et al., J. Vac. Sc. Technol. B Vol. 18 No. 2, Mar/Apr 2000 pp 956-961.

Regarding claim 1 Binh discloses (Fig. 1a page 957 column 1 paragraph 1, column 2 lines 51-56, page 958 column 2 lines 1-6) a method of extracting electrons in vacuum (10^{-7} Torr) from a cathode (SSE cathode) situated in spaced-apart relationship with an anode which is placed at a given potential V_{app} relative to the cathode by means of a bias source comprising making a cathode with one junction between a layer of metal serving as electron-reservoir and an ultrathin layer of n-type semiconductor, the junction (metal-semiconductor Schottky junction) possessing a potential barrier with a height of 0.1eV, the thickness of the n-type semiconductor being within nanometer range, injecting electrons through the metal/semiconductor junction creating a space charge in the semiconductor and using a bias source that creates an electric field and

injects electrons into a field controlled by the height of the surface potential barrier of the n-type semiconductor. Furthermore Binh discloses (page 959 column 1 lines 12,13) the thickness (height of conical protrusions) of the n-type semiconductor being about 10nm.

Regarding claim 2 Binh discloses (Fig. 1b, page 957, column 2, I-V characteristics) the bias source voltage V_{app} can be controlled to create an electric field such that vacuum barrier is too high to allow emission current ($V_{app} < V_0$, V_0 being threshold voltage), the electrons injected through the metal-semiconductor junction are trapped inside the semiconductor layer and the emission surface does not emit electrons and there is no emission current.

Regarding claim 3 Binh discloses (Fig. 1c, page 957, column 2, I-V characteristics) that by increasing the bias voltage ($V_{app} > V_0$), the related decrease of the barrier height becomes sufficient to allow tunneling of electrons through the surface barrier and hence the electric field causing the height of the surface potential barrier being equal to the level of the states occupied, electron emission occurs.

Regarding claim 4 Binh discloses (Fig. 1d, page 957, column 2, I-V characteristics) that by increasing the bias voltage ($V_{app} \gg V_0$) the height of the surface potential barrier of n-type conductor becomes lower than the level of states occupied by the electrons and negative electron affinity surface appears.

Regarding claim 5 Binh discloses (page 960, column 1, Conclusions) the injection across Schottky junction of a significant concentration of electrons is controlled by temperature and hence temperature controls the flux of emitted electrons.

Claim 6 essentially recites the same limitations of method of extracting electrons of claim 1 for the device for extracting electrons and hence is rejected for the same reason (see rejection of claim 1).

Claim 8 essentially recites the same limitations of claim 1 for electron emission cathode for extracting electron beam in vacuum and hence is rejected for the same reason (see rejection of claim 1).

Regarding claim 9 Binh discloses (page 958, column 2 lines 1-3) the metal/semiconductor junction (M-S Schottky junction) possesses a potential barrier of height in the range of 0.1ev.

Regarding claim 10 Binh discloses (Fig. 2a, 2b) the first portion forming an electron reservoir is formed by a metal layer carried on a semiconductor (Si wafer) substrate.

Regarding claim 11 Binh discloses (Fig. 2a, A) the n-type semiconductor layer possesses an emission surface that is planar.

Regarding claims 12-14 Binh discloses (Fig. 2c) the semiconductor member possessing an emission surface that presents protrusions.

In claim 12 the recitation of 'enabling electron emission to be confined' is functional language and has not been given patentable weight because it is in the narrative form.

In claims 13 and 14 the Examiner notes that the claim limitation that 'cathode projections made by lithographic techniques (claim 13) and obtained by ion bombardment (claim 14) are drawn to a process of manufacturing which is incidental to

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the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113). Therefore, it is the position of the examiner that it would have been obvious to one of ordinary skill in the art that the cathode projections disclosed by Binh is at least a fully functional equivalent to the Applicant's claimed invention as evidenced by all of the Applicant's claimed structural limitations.

Claims 19 and 20 essentially recite the same limitations as of claim 9 and hence are rejected for the same reason (see rejection of claim 9).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over 'Serial Process for Electron Emission from Solid-state Field Controlled Emitters' by Binh et al., J. Vac. Sc. Technol. B Vol. 18 No. 2, Mar/Apr 2000 pp 956-961.

Regarding claim 16 Binh discloses the invention except for the limitation of the substrate possessing point or pinhead shape. It has been held that a change in size is

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generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955). It would have been obvious to one having ordinary skill in the art to modify the substrate having point shape, since such a modification would have involve a mere change in the shape of a component.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over 'Serial Process for Electron Emission from Solid-state Field Controlled Emitters' by Binh et al., J. Vac. Sc. Technol. B Vol. 18 No. 2, Mar/Apr 2000 pp 956-961 as applied to claim 6 above, and further in view of JP 05342983 to Yoshiyasu.

Regarding claim 7 Binh does not explicitly disclose electron extraction electrode.

Yoshiyasu in analogous field of field emitters discloses (abstract Fig. 1) discloses electron emitter comprising semiconductor layer formed on a metal electrode and extraction electrode (gate electrode) 4 formed on an insulating film 3 and anode electrode 5. Yoshiyasu discloses the extraction electrode focuses the electrons emitted from the emitter and are collected by the anode (collector electrode).

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include the extraction electrodes on the metal-semiconductor cathode followed by the anode of Binh as taught by Yoshiyasu for focusing the electrons emitted from the cathode and thus enhancing the emission current.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over 'Serial Process for Electron Emission from Solid-state Field Controlled Emitters' by Binh et al.,

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J. Vac. Sc. Technol. B Vol. 18 No. 2, Mar/Apr 2000 pp 956-961, and further in view of U.S. Patent 6,177,701 to Matsumoto.

Claim 15 differs from Binh in that Binh does not exemplify the semiconductor substrate having active components arranged therein for locally controlling the electron emission.

Matsumoto in pertinent field of semiconductor devices discloses (Fig. 5 column 7 lines 20-37) semiconductor substrate having active components like transistor 21 formed on it. Matsumoto discloses this configuration of semiconductor substrate with active and passive components provides integrated circuit device which can be prepared in advance.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include active components in the semiconductor substrate of Binh as taught by Matsumoto for providing integrated circuit device which can be prepared in advance.

Response to Arguments

Applicant's arguments with respect to claims 1 and 6 have been considered but are moot in view of the new ground(s) of rejection.

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Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (571) 272-2463. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sikha Roy

Sikha Roy
Patent Examiner
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